

USE OF MATERNITY REGISTER DATA IN BENIN

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TABLE OF CONTENTS

1. Introduction.....	1
2. Methodology	5
Phase 1	5
Phase 2	5
Phase 3	5
Sampling	6
Training and Fieldwork.....	7
Data Processing.....	7
3. Results.....	9
Results from the Census.....	9
Results from the In-depth Survey of Health facilities.....	10
Completeness of Data	17
Validity of cesarean section data	21
Compliance with Referrals.....	21
Use of data for decision-making	23
Indicators of health care provision and outcome	23
4. Qualitative Study Results.....	27
Conclusions.....	29
References.....	31

1. INTRODUCTION

In 1997 several UN agencies published guidelines defining a series of six process indicators to monitor the availability and use of emergency obstetric care (UNICEF, WHO, UNFPA 1997). This approach was promoted in recognition of the limitations involved in the measurement of maternal mortality for program evaluation purposes. The guidelines emphasize the importance of using this series of indicators as a means of monitoring service availability, utilization of maternal health services, utilization of these services among those in need and quality of obstetric care. Included in the list of indicators are number of basic and comprehensive emergency obstetric care facilities per 500,000 population, percent of births occurring in an emergency obstetric care facility, met need for emergency obstetric care, cesarean section rate and case fatality rate.

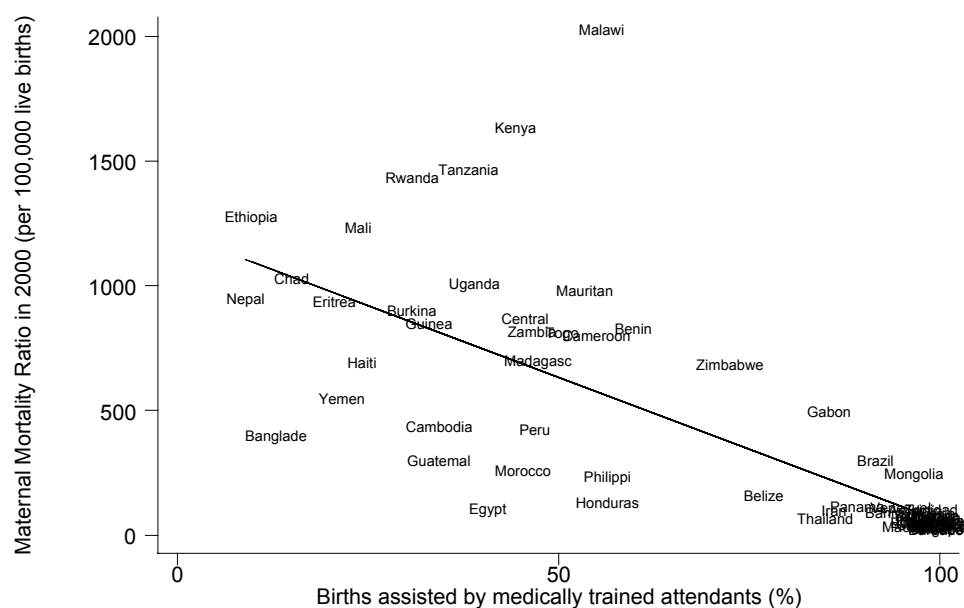
Data for the UN process indicators of availability and use of emergency obstetric care are now available from at least 15 countries (Bailey and Paxton 2002, AMDD Working Group on Indicators 2002a,b,c, Goodburn et al. 2001, Hussein et al. 2001, Ministry of Health and Family Welfare/Bangladesh 2000, Ronsmans 1999), and data collection is underway in a number of additional countries. Often, these data are collected as part of the monitoring and evaluation plan for large-scale, donor-funded intervention programs designed to increase the use of emergency obstetric care as a means of reducing maternal mortality.

As programs with international backing are more likely to result in publications in journals from developed countries, it is unclear if significant effort is underway in developing country settings to collect the UN process indicators without technical assistance. What is known and has been well-documented is the effort required to put into place the data collection systems needed to generate the process indicators (Goodburn et al. 2001, Ronsmans et al. 1999, MotherCare and John Snow, Inc. 1999, Ronsmans et al. 2002). All accounts suggest that these data are feasible to collect, an important and informative management tool, and, equally important, that the effort required to generate these data constitute an intervention in and of itself. These efforts are necessary because maternity register data often do not contain the requisite information for the generation of the process indicators (particularly as regards obstetric complications) and because maternity register data are frequently not standardized within or across health facilities.

A review of literature documenting the collection and use of process indicators makes clear that these indicators are intended for management-related decision-making at the national and district levels. Only one reference referred to their use at the individual health facility level, but did not provide an example of such use (Hussein et al. 2001). Of the six UN process indicators, the case fatality rate is the indicator most obviously appropriate for use at the facility level at first glance. The other indicators could be appropriate at the facility level but would require the difficult task of establishing the catchment area of a health facility in order to determine the denominators for availability of emergency obstetric care, met need and births in an emergency obstetric care facility.

So, what can an individual health facility do if it does not have the financial and technical resources to develop and put into place a new maternity register? Are the existing data in an individual health facility useful “as is” for the purposes of monitoring and evaluation of the obstetric care provided within that facility? That is, are there data currently available that could be used to address issues within the authority of a facility? These were the questions addressed by a study of maternity register data in two departments in Benin.

Figure 1 Maternal Mortality Ratios in 2000 plotted against the percent of births assisted by a medically trained attendant; 64 countries



Data source: database compiled for the WHO/Unicef estimation of Maternal Mortality Ratios in 2000

These questions are critical for sub-Saharan Africa where ecological analyses imply that quality of care (and the infrastructure that supports such care) may be of greater concern than access to care. For example, in a simple plot of maternal mortality ratios on the percent of births with a medically trained attendant from 64 developing countries (Figure 1), sub-Saharan countries consistently fall above the regression line (Stanton et al. 2003). That is, for a given level of professional assistance at birth, maternal mortality is higher in Sub-Sahara than in other regions. Although there are no doubt multiple explanations for the apparent, relative ineffectiveness of medically trained attendants in sub-Saharan Africa (including macro-level indicators of economic development), it is clear that facility-based quality of obstetric care is a serious issue in this region (Ifenne et al. 1997, Leigh et al. 1997, Grossman-Kendall et al. 2001).

In Benin, estimates of the maternal mortality ratio range from 338 to 498 per 100,000 live births (Kodjogbe et al. 1997, Stanton et al. 2001). At the national level, approximately three quarters of births are assisted by a medically trained attendant, of which 87 percent take place in a public health facility. In Atlantique and Zou¹, the two departments in which this study was conducted, professional assistance at birth is even higher at 90 and 80 percent, respectively (INSAE 2002).

Most health facilities which include a maternity in Benin maintain registers which document pregnancy, labor and birth. Selected data from these registers are aggregated and passed quarterly to the National Health Information System (SNIGS). Record-keeping in the maternity unit of health facilities in Benin takes several forms. There is a wide variety of registers (some of which are described in this report), partographs (which include additional information about the delivery recorded on the flip side), and maternal health cards which are kept by the woman. Only in the two largest health facilities in the capital

¹ These departments are now referred to as Atlantique/Littoral and Zou/Collines. For the purposes of this report, they are referred to as Atlantique and Zou.

city and in some mission-sponsored health facilities are individual medical records maintained and archived. Of these various data sources, registers are the easiest from which to abstract information.

This report describes a study of the content and use of routinely collected data from maternity registers for the purposes of monitoring for maternal and newborn health at the health facility level in two departments of Benin. Specifically, the objectives of the study are to:

- Describe the scope, quality, completeness and use of the information collected in maternity registers in the departments of Atlantique and Zou;
- Calculate indicators which reflect clinical practices and outcome, such as: the cesarean section rate (for health facilities with surgical capacity), the referral rate, the rate of referred patients who are treated at the referral site, the episiotomy rate, the rate of “directed” deliveries (i.e., deliveries where oxytocics were used) and stillbirth and maternal death rates in health facilities in the departments of Atlantique and Zou;
- Validate the data regarding cesarean section operations recorded in the delivery register against that recorded in the surgical register;
- Describe the process by which data are recorded in the maternity registers.

2. METHODOLOGY

To achieve these objectives, the study team organized activities in three phases, which are summarized in Figure 2. The phases are:

PHASE 1

A census of all health facilities managing at least ten deliveries per month in the departments of Atlantique and Zou. The census was conducted in order to describe the number and types of registers maintained in each of the health facilities, and to provide a sampling frame for the selection of health facilities for this study. Development of a sampling frame was required as it had been four years since the Ministry of Health (MoH) had updated its list of health facilities. To update this list, supervisors for the study began by visiting each departmental subdivision (sous-prefecture) and contacting the hospital director. Hospital directors assisted survey teams by identifying all health facilities in the sous-prefecture that managed deliveries and did not appear on the MoH list. The census was conducted between March 12-29th, 2002.

PHASE 2

An in-depth study of a sample of 48 health facilities (24 health facilities in each of the two selected departments). Within selected health facilities, four different types of registers were studied. Registers selected for study include the (1) delivery register (i.e., the labor and delivery room logbook); (2) referral register; (3) adverse pregnancy outcome register; and (4) the surgical register. These registers were selected for study because they concern the process of delivery.

Study components included:

1. A comparison of the data items recorded in the selected registers against the complete list of all data items identified in these types of registers during the census of health facilities;
2. An evaluation of the completeness of the information recorded in the four types of registers;
3. Calculation of a selection of indicators appropriate for quarterly monitoring within the maternity;
4. Validation of the information regarding cesarean section operations recorded in the delivery register against the information recorded in the surgical register. This validation was carried out to see if information in the delivery register is sufficiently complete to use for monitoring purposes.
5. Documentation of the percent of cases admitted to a higher level of care among all cases referred to a higher level of care. This component of the study was restricted to the department of Zou where all health facilities with surgical capacity were included in the sample;
6. A description of how data in the four selected registers are currently being used;
7. A qualitative study to discern attitudes toward the collection of maternity register data and ideas for its use by maternity personnel.

PHASE 3

Analysis of the quantitative and qualitative data. The results are presented in this report. The results were also used to assist in the development of a manual on data collection for indicators appropriate for monitoring at the facility level.

Figure 2: Description of the three phases of the Benin Maternity Register Study

Phase 1: Census of all public and private health facilities managing 10 or more deliveries per month in the departments of Atlantique and Zou. Development of a sampling frame from which to select health facilities for the in-depth study.	
Phase 2 – quantitative study: Data collection within 48 selected health facilities to permit identification of the data items recorded, evaluation of their completeness, calculation of indicators reflecting service provision and quality of care; validation of data on cesarean section recorded in the maternity register; documentation of the percent of cases (women) admitted at a higher level of care among all cases referred in Zou.	Phase 2 – qualitative study: Four focus groups conducted to explore maternity personnel attitudes toward the collection of data in the registers and the use of these data for monitoring purposes
Phase 3: Data analysis and the development of a manual on the use of maternity register data for the purposes of monitoring and evaluation	

SAMPLING

The sample was stratified into three categories of health facility in order to assure that all types of maternity in these two departments were represented. These are:

Stratum 1: public and private health facilities with surgical capacity that manage at least ten deliveries per month

Stratum 2: public health facilities without surgical capacity that manage at least 10 deliveries per month

Stratum 3: private health facilities without surgical capacity that manage at least 10 deliveries per month

This stratification serves two purposes. It prevents under-representation of health facilities with surgical capacity, which are few in number. Theoretically, it could also allow for the identification of differences in how registers are maintained and used in health facilities offering different types of care. However, it was accepted that, given the small sample size within strata, the data would not produce statistically significant differences unless there were marked differences across strata. A total of 48 health facilities were selected for the study. Sample size was determined by the budget available. The selection of health facilities within strata is described below.

- 1) In the department of Zou there are a total of six health facilities with surgical capacity. All six of these health facilities were selected for the sample. In Atlantique department, 11 health facilities have surgical capacity of which six were selected. In Atlantique, selection was made with probability proportional to the annual average number of cesarean operations performed in the each facility, increasing the chances of selecting high-volume health facilities.
- 2) Nine health facilities were selected in each of the remaining two strata in each department. Selection was made with probability proportional to the annual volume of deliveries managed in that facility. As with Stratum 1, this increases the chances of selecting high-volume health facilities.

The unit of analysis in this study varies depending on the question being asked. The unit of analysis for most questions is a health facility or a maternity-related register within a health facility; for example, the percent of all health facilities which maintain a delivery register, and the percent of delivery registers which include a specific variable. For study components 2-5, the unit of analysis is an individual case (woman) recorded in one of the registers of interest. The selection of cases for these objectives is described below:

- *Completeness of the information recorded in the four types of registers:* the last ten cases recorded in the four registers of interest were selected;
- *Calculation of indicators reflecting service provision and quality of care:* selection of cases was based on the volume of deliveries in each maternity. For example, for health facilities managing 360 deliveries or more per year, all cases in the month of April 2002 were selected; for health facilities managing 240-359 deliveries per month, all cases in the months of March and April 2002 were selected; for health facilities managing 120-239, all cases in the months February-April 2002 were selected.
- *Validation of cesarean section operations recorded in the delivery register:* the last 20 cases were selected in all health facilities with surgical capacity.
- *Documentation of the percent of referred cases admitted to a higher level of care:* the last ten cases recorded in the referral register were selected.

TRAINING AND FIELDWORK

Two types of training were conducted for field staff. A two-day training was held for the sociologist responsible for moderating the focus groups. This training involved a review of the discussion guide and preparation for the focus group discussions. Training for the teams assigned to data collection within the health facilities lasted five days. Twelve interviewers and two supervisors were trained. The group of interviewer trainees included medical students who were within weeks of completing their medical training and statisticians with field experience in data collection. The team supervisors were physicians. The training was based on a manual prepared for this study that introduced trainees to all of the data collection forms and methods for their completion. Three days were spent reviewing the manual and two days were dedicated to pretesting the data collection forms in health facilities outside of the sample.

Two focus group discussions were conducted and audio-recorded in each of the departments between June 25 and 28, 2002. Separate focus groups were conducted with general practitioners and obstetricians, and with midwives, nurses (and one nurses' aides). Focus group participants came from both the public and private sector. The discussions were held in the cities of Cotonou and Abomey.

The quantitative study was conducted between May 27 and June 15 using five teams of interviewers. Each team consisted of two interviewers (one medical student and one statistician) and a supervisor (a physician).

DATA PROCESSING

The qualitative data were transcribed from the cassette tapes and analyzed for major themes. All data from the quantitative study were double-entered to reduce errors. Data entry and cleaning was done using EPIDATA. ACCESS 2000 was used to create the database that was eventually converted for use with SPSS for tabulation.

3. RESULTS

RESULTS FROM THE CENSUS

The total number of health facilities managing ten deliveries or more identified during the census was 224. One hundred eighteen health facilities were in Atlantique, of which 54 percent were public facilities without surgical capacity, 36 percent were private facilities without surgical capacity and 9 percent were health facilities with surgical capacity. One hundred six health facilities were in Zou, of which 78 percent were public health facilities without surgical capacity, 16 percent were private health facilities without surgical capacity and 6 percent were health facilities with surgical capacity (Table 1). The majority of the public health facilities are Communal Health Complexes which offer several, but not all, of the functions of a basic emergency obstetric care facility.

The annual volume of deliveries managed in health facilities varies by stratum. In both Atlantique and Zou, the health facilities with surgical capacity tend to manage the greatest number of deliveries. As shown in Figure 3, the median number of deliveries annually in facilities with surgical capacity in Atlantique and Zou is 423 and 800, respectively. The median, however, obscures large variation in the volume of deliveries managed by two health facilities in Atlantique which manage between 3,000 to more than 6,000 deliveries annually. In general, private health facilities have the lowest volume of deliveries with a median of approximately 140 deliveries annually in both departments.

In total, 26 different types of register were identified across all 224 health facilities visited during the census. The average number of registers kept in each facility was 4.6 in Atlantique and 4.2 in Zou. The largest number of registers located in a single facility was 15. Public facilities maintain more registers than private health facilities. For example, the average number of registers in public health facilities ranged from 6 in Atlantique to 4.7 in Zou. In private health facilities, the average number of registers varied from three in Atlantique to 1.9 in Zou (data not shown).

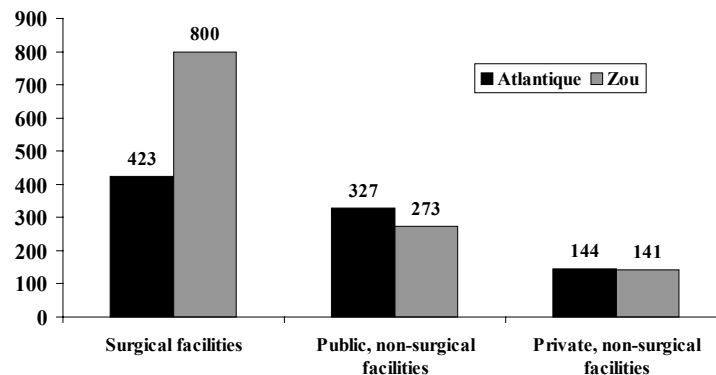
For the purposes of this project, four different types of register were selected for study. These are the delivery, referral, adverse outcome and surgical registers. Registers which were not explored during the in-depth study included such topics as: sexually transmitted diseases, prenatal visit, postnatal visit, information/education/communication, abortion, birth certificates, shift notes, vaccination, malnutrition and financial accounting.

Figure 4 shows the percentage of health facilities identified in the census which maintained the four registers of interest to this study. Delivery registers were by far the most common. Between 64 and 92

Table 1: Percent distribution of health facilities by stratum and department; Census of the Benin Maternity Register Study 2002

Department	Stratum 1 Health Facilities w/ surgical capacity %	Stratum 2 Public Facilities w/out surgical capacity %	Stratum 3 Private Facilities w/out surgical capacity %	Total %	N
Atlantique	9.3	54.2	36.4	100.0	118
Zou	5.7	78.3	16.0	100.0	106
Total	7.6	65.6	26.8	100.0	224

Figure 3: Annual median number of facility-based deliveries by stratum and department; Census of the Benin Maternity Register Study, 2002



percent of health facilities across all strata in both departments maintain a delivery register. Referral registers were the second most common. Referral registers were located in 82 and 66 percent of public health facilities in Atlantique and Zou, respectively, but were fairly uncommon in private health facilities (30 percent or less). Only 18 and 30 percent of health facilities with surgical capacity maintained a referral register. This is not surprising given that these facilities are themselves referral hospitals. The adverse outcome register was the least common register during the census and was particularly rare in Atlantique. Surgical registers were found in approximately one-third of the health facilities with surgical capacity.

RESULTS FROM THE IN-DEPTH SURVEY OF HEALTH FACILITIES

During fieldwork for the in-depth survey of health facilities, it was noted that in a small number of cases, health facilities started new registers that had not been maintained at the time of the census. This is evident in Figure 5 which shows the percent of health facilities that maintain the various types of registers from the sample selected for the in-depth survey. The same approximate patterns described above from the census of health facilities are seen in the in-depth sample, though levels are higher. For example, public facilities without surgical capacity are the most likely to maintain a referral register and the adverse outcome register is the register most likely to be omitted.

Two marked differences between the census and the in-depth sample are: (1) 100 percent of all health facilities maintained a delivery register in the in-depth sample, whereas delivery registers were common (with between 60 and 90 percent of all facilities maintaining these registers) but not universal in the census and (2) 100 percent of all health facilities with surgical capacity maintained a surgical register in the in-depth sample as compared to only about 30 percent in the census. There are two possible explanations for these discrepancies. First, given that high-volume health facilities are more likely to maintain registers than low-volume facilities, the increased presence of registers is likely to be partially due to sampling procedures which favored the selection of high-volume health facilities. Second, although it is possible that in a few cases, survey teams during the census may have missed locating a register, it is assumed that in most cases the establishment of new registers by facility staff was in response to the survey teams' visits during the census.

The physical form and format of the registers varied substantially across health facilities. Some of the registers were large, blank hard-back books with hand-traced columns, and some were pre-printed paperback log books designed for the recording of specific information. Many of the registers were small

Figure 4: Percentage of health facilities by type of registers maintained, by stratum and department; Census of the Benin Maternity Register Study, 2002

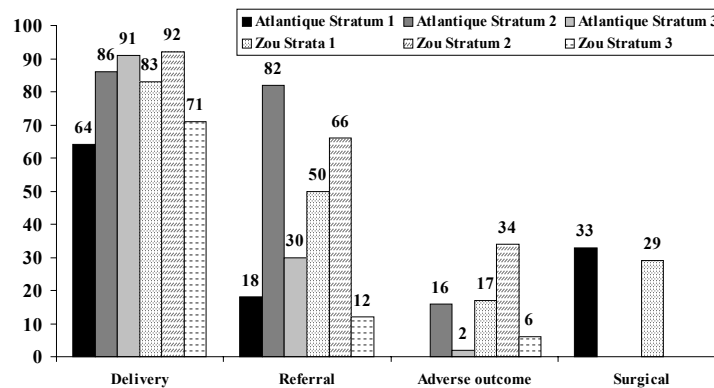
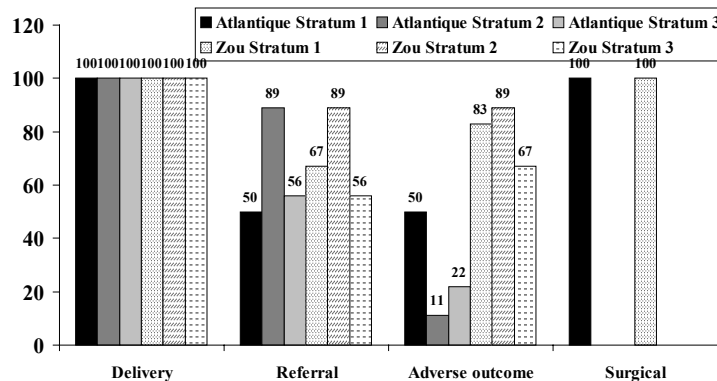


Figure 5: Percentage of health facilities by type of registers maintained and by stratum and department from the sample for the in-depth study of health facilities; In-depth survey of the Benin Maternity Register Study, 2002



student composition notebooks purchased at the market by the facility staff. Information was recorded in these notebooks in one of two ways; either in hand-traced columns with one line per woman or in paragraph form, relying on free text with horizontal lines drawn to separate one case from the following. The survey teams also found “all purpose” registers, that is, one register in which information was recorded on antenatal care, deliveries, referrals and adverse outcomes.

There are few patterns regarding the format of the different types of register. See Tables 2a-d. Very few of the registers are pre-printed logbooks. Most are notebooks which require recording information in hand-traced columns, except for surgical registers which tend to be free text. The information recorded in all four types of registers were considered legible by the survey teams in almost all health facilities.

With the exception of referrals, most registers are completed after the delivery or intervention and the registers tend to be completed by midwives, nurses or nurses’ aides. In less than half of the health facilities in each stratum were the personnel responsible for completing the various registers trained for this task. See Tables 3a-d.

Table 2a: Percent of health facilities with a delivery register by stratum and by department and characteristics of the register; In-depth survey of the Benin Maternity Register Study 2002

Characteristics of the Delivery register	Stratum 1 Health Facilities w/ surgical capacity	Stratum 2 Public Facilities w/out surgical capacity	Stratum 3 Private Facilities w/out surgical capacity
	%	%	%
Atlantique			
Printed	17	0	11
Notebook w/ hand-traced columns	20	56	75
Free text	80	44	22
Legible	100	100	89
N of health facilities	6	9	9
Zou			
Printed	0	0	0
Notebook w/ hand-traced columns	30	100	78
Free text	50	0	22
Legible	100	89	89
N of health facilities	6	9	9

Table 2b: Percent of health facilities with a referral register by stratum and by department and characteristics of the register; In-depth survey of the Benin Maternity Register Study 2002

Characteristics of the Referral register	Stratum 1 Health Facilities w/ surgical capacity	Stratum 2 Public Facilities w/out surgical capacity	Stratum 3 Private Facilities w/out surgical capacity
	%	%	%
Atlantique			
Printed	0	0	0
Notebook w/ hand-traced columns	67	88	80
Free text	33	13	20
Legible	100	75	100
N of health facilities	3	8	5
Zou			
Printed	50	13	0
Notebook w/ hand-traced columns	100	100	60
Free text	0	0	40
Legible	100	88	80
N of health facilities	4	8	5

Table 2c: Percent of health facilities with an adverse outcome register by stratum and by department and characteristics of the register; In-depth survey of the Benin Maternity Register Study 2002

Characteristics of the Adverse outcome register	Stratum 1 Health Facilities w/ surgical capacity	Stratum 2 Public Facilities w/out surgical capacity	Stratum 3 Private Facilities w/out surgical capacity
	%	%	%
Atlantique			
Printed	0	0	0
Notebook w/ hand-traced columns	100	100	50
Free text	33	0	50
Legible	100	100	100
N of health facilities	3	1	2
Zou			
Printed	20	13	0
Notebook w/ hand-traced columns	100	86	67
Free text	0	14	33
Legible	80	100	83
N of health facilities	5	8	6

Table 2d: Percent of health facilities with surgical register by department and characteristics of the register; In-depth survey of the Benin Maternity Register Study 2002

Characteristics of the Surgical Register	Stratum 1 Health facilities w/ surgical capacity	Stratum 1 Health facilities w/ surgical capacity
	%	%
	Atlantique	Zou
Format		
Printed	0	0
Notebook w/ hand-traced columns	33	40
Free text	83	67
Legible	100	83
N of health facilities	6	6

Table 3a: Percentage of health facilities with a delivery register by stratum and by department and characteristics of the register; In-depth survey of the Benin Maternity Register Study 2002

Process of completing the register	Stratum 1 Health Facilities w/ surgical capacity %	Stratum 2 Public Facilities w/out surgical capacity %	Stratum 3 Private Facilities w/out surgical capacity %
Atlantique			
Completed during the delivery/decision	50	22	22
Completed after the delivery/decision	50	78	78
Completed by the person responsible for the intervention	83	67	100
Completed by the midwife	83	100	89
Person responsible for completion of register was trained for the task	0	44	44
N of health facilities	6	9	9
Zou			
Completed during the delivery/decision	0	0	11
Completed after the delivery/decision	100	100	89
Completed by the person responsible for the intervention	67	67	56
Completed by the midwife	100	56	44
Person responsible for completion of register was trained for the task	0	22	44
N of health facilities	6	9	9

Table 3b: Percentage of health facilities that maintain a referral register by stratum and by department and characteristics of the register; In-depth survey of the Benin Maternity Register Study 2002

Process of completing the register	Stratum 1 Health Facilities w/ surgical capacity %	Stratum 2 Public Facilities w/out surgical capacity %	Stratum 3 Private Facilities w/out surgical capacity %
Atlantique			
Completed during the delivery/decision	67	100	100
Completed after the delivery/decision	0	0	0
Completed by the person responsible for the intervention	67	75	80
Completed by the midwife	67	100	100
Person responsible for completion of register was trained for the task	0	38	20
N of health facilities	3	8	5
Zou			
Completed during the delivery/decision	100	100	80
Completed after the delivery/decision	0	0	0
Completed by the person responsible for the intervention	100	75	40
Completed by the midwife	100	62	60
Person responsible for completion of register was trained for the task	0	13	20
N of health facilities	4	8	5

Table 3c: Percentage of health facilities that maintain an adverse outcome register by stratum and by department and characteristics of the register; In-depth survey of the Benin Maternity Register Study 2002

Process of completing the register	Stratum 1 Health Facilities w/ surgical capacity %	Stratum 2 Public Facilities w/out surgical capacity %	Stratum 3 Private Facilities w/out surgical capacity %
Atlantique			
Completed during the delivery/decision	33	100	0
Completed after the delivery/decision	33	0	100
Completed by the person responsible for the intervention	33	100	0
Completed by the midwife	100	100	100
Person responsible for completion of register was trained for the task	0	0	50
N of health facilities	3	1	2
Zou			
Completed during the delivery/decision	20	38	0
Completed after the delivery/decision	80	50	67
Completed by the person responsible for the intervention	80	75	50
Completed by the midwife	80	62	50
Person responsible for completion of register was trained for the task	0	13	17
N of health facilities	5	8	6

Table 3d: Percentage of health facilities that maintain a surgical register by department and by characteristics of the register; In-depth survey of the Benin Maternity Register Study 2002

Process of completing the register	Stratum 1 Health facilities w/surgical capacity %	Stratum 1 Health facilities w/surgical capacity %
	Atlantique	Zou
Completed during the delivery/decision	0	50
Completed after the delivery/decision	100	50
Completed by the person responsible for the intervention	67	33
Completed by the midwife	33	17
Completed by the doctor	67	33
Person responsible for completion of register was trained for the task	17	17
N of health facilities	6	6

COMPLETENESS OF DATA

A two-step process was used to assess the completeness of data in the four registers of interest. The first step involved determining the consistency of the variables in each register type and the second step involved documenting whether data were recorded for existing variables in the registers. Validity of these data was not explored.

To assess the consistency in the content of the registers, a variable list was generated for each type of register. This list contained all of the variables seen in that type of register in the health facilities visited during the census. This list served as a comprehensive checklist of the all data items collected against which register content from the sample of health facilities visited during the in-depth study could be compared. Tables 4a-d present the variables included in the checklist for each register type and the percent of health facilities with registers containing each of these variables. One should note that the numbers of health facilities with referral and adverse outcome registers is very small.

Variables most frequently recorded in the delivery register include: name of woman, date and hour of delivery, sex of infant and obstetrical observations. Fifty percent or more of the health facilities across strata and departments include these variables in the delivery register. It should be noted that obstetrical observation generally consists of notes to determine whether the delivery was normal, “dystocic” or “directed.” The non-specific use of the term “dystocic” in French to mean “complicated” is common. “Directed” as used in Benin refers to deliveries for which oxytocic injections were given at some point during labor. Further details regarding the identification of obstetric complications or pregnancy outcome were not available from these registers.

In general, the variables most frequently absent in the delivery registers in Atlantique and Zou were: age of woman, address, date of admission, hour of admission, gestational age, place of birth (health facility versus at home, followed by a post-delivery referral to a health facility), APGAR score, and discharge date. These variables were missing for 50 percent or more of the health facilities in at least two of the three categories of health facility in Atlantique or Zou.

Variables most frequently included in referral registers include: name of woman, date of referral, place of referral, and reason for referral. Variables most frequently absent from referral registers were: age of woman, address, mode of transport, outcome for the infant/fetus (stillbirth, live birth), “referral” outcome (outcome for the woman and or infant), counter-referral (notification of the treatment and outcome of a referral), and date of counter-referral.

Variables most frequently included in adverse outcome registers were: name of woman, date of outcome, diagnosis, pregnancy outcome, and action taken. Variables most frequently absent from adverse outcome registers were: age of woman, address, gravidity, and parity.

Surgical registers were found to be consistent. They consistently contained the following six variables in both Atlantique and Zou: identification number, name of woman, pre-operative diagnosis, age, date of delivery, and intervention.

For monitoring purposes, the adverse outcome register is the register most likely to be missing from health facilities, and the referral register is the most deficient regarding content. Rarely do maternity staff know if a referred patient was received at a higher level of care or know the outcome for that patient. Anecdotally, conversations with midwives during the census suggested that when the sending-hospital did know of the patient’s outcome, it was due to return visits by the patient’s family and not official notification by the receiving hospital.

Table 4a: Percentage of health facilities with delivery registers that contain each of the variables in the inventory checklist by stratum and department; In-depth survey of the Benin Maternity Register Study 2002

Variables in Delivery Register	Stratum 1 Health Facilities w/ surgical capacity %	Stratum 2 Public Facilities w/out surgical capacity %	Stratum 3 Private Facilities w/out surgical capacity %
Atlantique			
Number	100	78	100
First and last name of woman	100	100	100
Woman's age	83	33	67
Home address	33	89	33
Gravidity	83	89	67
Parity	83	89	67
Admission date	17	22	11
Hour of admission	0	11	0
Gestational age	50	44	11
Date of delivery/birth	83	100	78
Hour of delivery/birth	83	89	78
Obstetrical observations : normal, dystocia and "directed" (oxtocics) delivery	83	100	100
Place of birth (home or health facility)	33	56	22
Delivery mode (vaginal, operative)	83	100	78
APGAR	0	22	11
Sex of infant	83	89	56
Birthweight	83	89	44
Date of discharge	0	0	0
Percent of variables covered compared to entire inventory	60	67	51
N of health facilities/registers	6	9	9
Zou			
Number	100	100	89
First and last name of woman	100	100	100
Woman's age	67	0	44
Home address	100	100	89
Gravidity	67	33	67
Parity	67	33	44
Admission date	0	11	22
Hour of admission	0	11	22
Gestational age	33	0	11
Date of delivery/birth	100	100	78
Hour of delivery/birth	100	100	78
Obstetrical observations : normal, dystocia and "directed" (oxtocics) delivery	100	78	56
Place of birth (home or health facility)	17	44	56
Delivery mode (vaginal, operative)	100	44	56
APGAR	33	11	11
Sex of infant	100	100	89
Birthweight	100	100	89
Date of discharge	100	100	100
Percent of variables covered compared to entire inventory	66	54	56
N of health facilities/registers	6	9	9

Table 4b: Percentage of health facilities with referral registers that contain each of the variables in the inventory checklist by stratum and department; In-depth survey of the Benin Maternity Register Study 2002

Variables in Referral Register	Stratum 1 Health Facilities w/ surgical capacity %	Stratum 2 Public Facilities w/out surgical capacity %	Stratum 3 Private Facilities w/out surgical capacity %
Atlantique			
Number	67	38	40
First and last name of woman	100	100	100
Address	33	63	20
Age of woman	67	50	40
Reason for referral	100	100	80
Date of referral	100	100	100
Hour of referral	67	75	40
Place of referral	100	100	60
Mode of transportation	0	25	0
Outcome of the pregnancy : live birth, stillbirth, born alive and died	33	25	0
Outcome of the referral : maternal death, infant death, living infant	0	38	0
Signature	67	63	60
Counter-referral	33	25	0
Date of counter-referral	0	0	0
Discharge diagnosis	0	0	0
Percent of variables covered compared to entire inventory	54	56	39
N of health facilities/registers	3	8	5
Zou			
Number	100	88	20
First and last name of woman	100	100	100
Address	75	88	100
Age of woman	75	38	20
Reason for referral	50	75	80
Date of referral	100	100	100
Hour of referral	75	75	60
Place of referral	75	75	100
Mode of transportation	50	25	0
Outcome of the pregnancy: live birth, stillbirth, born alive and died	50	88	60
Outcome of the referral : maternal death, infant death, living infant	0	13	0
Signature	0	0	0
Counter-referral	0	25	20
Date of counter-referral	50	13	0
Discharge diagnosis	50	13	0
Percent of variables covered compared to entire inventory	56	52	43
N of health facilities/registers	4	8	5

Table 4c: Percentage of health facilities with adverse outcome registers that contain each of the variables in the inventory checklist by stratum and department; In-depth survey of the Benin Maternity Register Study

Variables in Adverse Outcome Register	Stratum 1 Health Facilities w/ surgical capacity %	Stratum 2 Public Facilities w/out surgical capacity %	Stratum 3 Private Facilities w/out surgical capacity %
Atlantique			
Number	33	100	100
First and last name of woman	100	100	100
Age of woman	33	100	50
Address	33	100	100
Gravidity	67	100	50
Parity	67	100	50
Date	100	100	100
Diagnosis	67	100	50
Pregnancy outcome	100	100	100
Action taken	67	100	100
Percent of variables covered compared to entire inventory	67	100	80
N of health facilities/registers	3	1	2
Zou			
Number	60	63	33
First and last name of woman	100	100	100
Age of woman	40	13	17
Address	80	100	83
Gravidity	20	13	50
Parity	20	13	17
Date	100	100	100
Diagnosis	100	63	100
Pregnancy outcome	100	88	83
Action taken	60	63	83
Percent of variables covered compared to entire inventory	68	61	67
N of health facilities/registers	5	8	6

Table 4d: Percentage of health facilities with surgical registers that contain each of the variables in the inventory checklist by department; In-depth survey of the Benin Maternity Register Study 2002

Variables in Surgical Outcome Register	Stratum 1 Health facilities w/surgical capacity % Atlantique	Stratum 1 Health facilities w/surgical capacity % Zou
Number (ID)	100	83
First and last name of woman	100	100
Pre-operative diagnosis	100	100
Age	100	100
Date of delivery	100	100
Intervention	100	100
Percent of variables covered compared to entire inventory	100	97
N of health facilities/registers	6	6

Table 5 presents the percent of cases for which data were recorded for existing variables in the different types of register. Although the content of these registers vary substantially, the data are remarkably complete for the variables included in each type of register. Data were recorded from 92 to 100 percent of the cases in all four register types. It is possible that visits by the survey teams during the census influenced subsequent recording habits and contributed to the suspiciously high levels of completeness.

VALIDITY OF CESAREAN SECTION DATA

The study assessed the validity of cesarean section data recorded in the delivery register by comparing it against data recorded in the surgical register, the register that is considered the gold standard for this variable. The purpose of the validation was to determine if data from the delivery register were sufficient to monitor cesarean sections. If so, this would facilitate data collection by reducing the number of registers from which data are compiled since no other data would be needed from the surgical register. The results are presented in Table 6. Approximately one in five of the cesarean sections recorded in surgical registers in Atlantique and Zou were not recorded in the delivery registers. Consequently, for monitoring purposes, one should rely on the surgical register for data on cesarean sections.

COMPLIANCE WITH REFERRALS

A two-step exercise was conducted to assess compliance with referrals. First, the names of the last ten cases listed in the referral registers in sampled health facilities in Zou were recorded. Second, survey teams searched for these same names in the registers at the hospital to which the women were referred. Table 7 presents the results. Across the different types of health facility, the following numbers of cases were pursued. Health facilities with surgical capacity: 22; public facilities without surgical capacity: 68; private facilities without surgical capacity: 38. A small number of health facilities in the north of Zou where emergency cases are generally referred to a hospital in the neighboring department were excluded from analysis. Forty-five, 51 and 63 percent of referred cases in Strata 1, 2 and 3 were identified at the higher level hospital to which the women were referred. This suggests that approximately one of two women who sought care at a hospital and were referred to a higher level of care actually arrived at the destination hospital. When the data were examined for individual hospitals, the percent of referred cases that were admitted to the referral hospital varied from zero to 100 percent and was closely correlated with the distance between the hospital of origin and destination (data not shown). Results from the survey questionnaire showed that the cost of referral transport varied from approximately \$1.80 US (1,610 CFA) for a motorcycle/taxi to \$6.30 US (5,674 CFA) for a hospital-based ambulance (data not shown). A separate study would be required to investigate the reasons for non-compliance and the outcome for these women.

Table 5: Percentage of cases for which data were recorded for all existing variables in the register by department, register type and strata; In-depth survey of the Benin Maternity Register Study

Type of Register	Stratum 1 Health facilities w/surgical capacity	Stratum 2 Public health facilities w/out surgical capacity	Stratum 3 Private health facilities w/out surgical capacity
Atlantique			
Delivery	100 (n=60)	99 (n=90)	98 (n=90)
Referral	100 (n=26)	99 (n=74)	92 (n=50)
Adverse outcome	100 (n=30)	100 (n=10)	100 (n=11)
Surgical	100 (n=120)	--	--
Zou			
Delivery	100 (n=60)	100 (n=90)	100 (n=90)
Referral	97 (n=33)	100 (n=80)	98 (n=50)
Adverse outcome	100 (n=50)	100 (n=73)	98 (n=57)
Surgical	100 (n=101)	--	--

Table 6: Percent of cesarean section cases recorded in the surgical register which were also recorded in the delivery register by department; In-depth survey of the Benin Maternity Register Study 2002

	Department	
	Atlantique	Zou
Percent of cesarean sections recorded in the surgical register which were also recorded in the delivery register	%	%
	82	80
N of cesarean sections in health facilities which had both surgical and delivery registers	120	101

Table 7: Among cases referred from a lower level hospital in Zou, percent who were admitted to the higher level/referral hospital by stratum; In-depth survey of the Benin Maternity Register Study 2002

	Zou Stratum 1 Health facilities w/surgical capacity %	Zou Stratum 2 Public facilities w/out surgical capacity %	Zou Stratum 3 Private facilities w/out surgical capacity %
Percent of referred cases admitted to higher level/referral hospital	45	51	63
N of referrals	22	68	38

USE OF DATA FOR DECISION-MAKING

Table 8 includes the percentage of health facilities that hold meetings to discuss register data and the frequency with which these meetings are held. There is no pattern across department or category of maternity. Between 44 and 89 percent of health facilities report holding meetings to discuss maternity register data. However, additional questioning suggested that these meetings were infrequent and/or irregularly timed at best. Still, health facilities do report using these data for local level planning and for decision-making regarding facility management. None to a third of public and private health facilities without surgical capacity report receiving feedback from the Ministry of Health on these data.

INDICATORS OF HEALTH CARE PROVISION AND OUTCOME

Table 9 presents a number of indicators of potential interest for monitoring purposes. The indicators in this table are calculated as averages across health facilities within each stratum. Of the indicators representing interventions, use of oxytocics during labor is the most common. This is particularly true in Atlantique where 38 to 47 percent of deliveries in all type of maternity receive this treatment. In Zou, the levels are notably lower, but still high, ranging from 13 to 27 percent of cases. From these data, it is not possible to distinguish use of oxytocics during the first and second stages of labor versus use in the third stage. For all health facilities, episiotomy was recorded for nine percent or less of cases. Four to 12 percent of cases are referred to a higher level of care. The cesarean section rates in Atlantique and Zou were 34 and 20 percent, respectively. Stillbirth rates ranged from one to eight percent of deliveries. Maternal deaths in the two month period examined for this study occurred only in the department of Atlantique and only in health facilities with surgical capacity. The hospital-based maternal mortality ratio in this stratum in Atlantique was 580 per 100,000 live births.

Table 8: Percent of health facilities that reported convening internal or external meetings to discuss data from the registers, percent that reported use of the data and percent that reported receiving feedback from department or national level by stratum and department; In-depth survey of the Benin Maternity Register Study 2002

Use of register data	Stratum 1 Health facilities w/ surgical capacity %	Stratum 2 Public facilities w/o surgical capacity %	Stratum 3 Private facilities w/o surgical capacity %
Atlantique			
Has internal meetings	67	44	89
Once a week	0	0	11
Once every two weeks	0	0	0
Once a month	17	22	22
Twice a year	17	0	33
Once a year	17	0	11
Irregularly	17	22	11
Has external meetings	17	78	56
Once a week	0	0	0
Once every two weeks	0	0	0
Once a month	17	68	22
Twice a year	0	11	11
Once a year	0	0	11
Irregularly	0	0	0
Never, can't remember the last time	0	0	0
Use of register data :			
For local planning	80	22	75
For management decisions within the health facility	67	22	44
Received feedback from higher level	80	33	22
Written	60	33	11
Oral	0	0	11
None	20	67	78
N	6	9	9
Zou			
Has internal meetings	83	67	67
Once a week	17	0	22
Once every two weeks	0	0	11
Once a month	33	33	11
Twice a year	17	22	22
Once a year	0	11	0
Irregularly	17	0	0
Has external meetings	67	78	33
Once a week	0	0	0
Once every two weeks	0	0	0
Once a month	17	33	11
Twice a year	0	11	11
Once a year	33	22	11
Irregularly	17	0	0
Never, can't remember the last time	0	11	0
Use of register data :			
For local planning	100	89	78

Use of register data	Stratum 1 Health facilities w/ surgical capacity %	Stratum 2 Public facilities w/o surgical capacity %	Stratum 3 Private facilities w/o surgical capacity %
For management decisions within the health facility	67	89	67
Received feedback from higher level	50	22	0
Written	33	22	0
Oral	17	0	0
None	50	78	100
N	6	9	9

Table 9: Average rate of procedures and outcomes by department and strata; In-depth survey of the Benin Maternity Register Study 2002

Department	Episiotomies %	“Directed” Deliveries (use of oxytocics) %	Referrals %	Stillbirths %	Maternal mortality ratio (hospital – based)	Cesarean section rate %
Atlantique						
Health facilities w/surgical capacity	9	44	No cases recorded	4	580 per 100,000 deliveries	34
Public health facilities w/out surgical capacity	4	38	12	2	No cases recorded	No cases recorded
Private health facilities w/out surgical capacity	9	47	4	1	No cases recorded	No cases recorded
Zou						
Health facilities w/surgical capacity	1	27	1	8	No cases recorded	20
Public health facilities w/out surgical capacity	No cases recorded	13	8	3	No cases recorded	No cases recorded
Private health facilities w/out surgical capacity	2	26	5	4	No cases recorded	No cases recorded

4. QUALITATIVE STUDY RESULTS

The focus group discussions began by asking participants in all four groups to describe the process in which women were received at a maternity and how data were recorded throughout her stay. In general, the physicians described a situation in which they are called by the midwife only for cases which have become complicated. Except for surgery, most physicians are not involved in recording information into the registers. The midwives, nurses and nurses' aides are primarily responsible for completing the registers, as well as the partographs, maternal health cards, etc. Depending on the physical state of the woman at admission, information is recorded immediately after the physical examination, or in the case of emergencies, as soon after her emergency care as possible. Occasionally, data are "memorized" and completed at a later time. In rural areas, the provision of care and the recording of data fall on the nurses' aides to a much greater degree than in urban health facilities.

Regarding use of the register data, some physicians, midwives and nurses reported using register data to discuss the care provided to a specific patient. Sometimes this is done at the foot of a patient's bed, sometimes the start of a new shift, and sometimes at the end of the week. Representatives from private health facilities offered that register data are also used to discuss the rise or fall in the volume of births managed at the facility and at times to reprimand maternity staff when performance deficiencies were identified. However, only rarely are these data used to discuss improvement in quality of care.

Some of the physicians reported that they only examine the data collected in the maternity when preparing department-level statistical reports and added that there is simply not enough time to devote to these data given the lack of qualified personnel working in health facilities. The group of midwives and nurses distinguished their sentiments regarding *collection* of the data required in the registers from their sentiments regarding the *recording* of this information. They see the process of asking these questions as a means of establishing rapport and are also aware that this information is what allows them to make clinical decisions regarding the care of each patient. The data currently collected in registers is seen as useful. All deplored the multitude of different registers and other data forms and the time that was required to complete them all. There was a clear consensus in these focus groups for the standardization of all maternity-based registers. Besides eliminating repetitious recording, it was also suggested that standardization of the registers would avoid registers in which information was recorded as "free text" and would eliminate the broad range of registers created at will by various staff in different health facilities.

Participants in all of the focus groups were asked what data they would like to discontinue collecting and what data they believe would be helpful which is not currently being collected. These questions were posed with the belief that if staff see a need for information from their own perspective, they would be more likely to collect and record this information accurately and more likely to put the data to use. In general, participants reported that the data being collected was useful and no one could suggest other data items which would be important to collect or ways in currently available data could be put to use.

CONCLUSIONS

The Benin Maternity Register Study was designed to assess the current and potential use of data routinely collected from registers and logbooks. The results suggest that a broad range of data is routinely collected, although there is little standardization in the content or format of these data. The sample of health facilities within each stratum is small, which precludes definitive statements regarding differences between health facilities with surgical capacity, and non-surgical public and private health facilities. In general, however, public health facilities are somewhat more likely than private ones to maintain the four registers pertaining to childbirth that were of interest to this study. Within the registers that were maintained, public health facilities tend to record more data items than in private health facilities. In all three categories of maternity included in the sample, data were remarkably complete for the data items specified in the registers. Results from the qualitative study data suggest that midwives, nurses and nurses' aides see value in the data collection process. The recording of the data is seen as a problem because of repetitious recording of the same information in multiple registers and forms. The desire for standardized reporting in maternity registers was universal among focus group participants

Routine data are being used for immediate decision-making regarding patient care and for reporting to the National Health Information System. Results from the quantitative study suggest that in some cases routine data are being used for planning and management purposes at the facility level. Results from the qualitative study suggest that these data are rarely discussed with maternity staff or between staff and supervisors for the purposes of improving processes of care. Furthermore, there is almost never feedback from higher levels regarding the data submitted to the departmental and national levels for the National Health Information System.

Although, the existing data do not meet the requirements to report on the UNICEF/WHO/UNFPA process indicators, they could provide numerous indicators that can be constructively used for monitoring purposes at the facility level. Examples include: hospital-based numbers and rates of cesarean section operations, episiotomy, directed delivery (i.e., use of oxytocics during labor) and referral. In fewer cases, maternal and perinatal death data are available. Some of these data are already being collected for reporting to the National Health Information System, but are not being examined at the facility level.

The maternity register data presented here clearly suggest that (a) attention to a number of issues is warranted and (b) interpretation of some of these indicators requires more in-depth information. Examples of such indicators include: cesarean section rates, compliance with emergency referral and use of oxytocics. Hospital-based cesarean section rates merit monitoring and attention for at least two reasons. The first reason is because these procedures, which can be life-saving when performed for maternal indication in hygienic conditions, can also lead to serious postpartum morbidities and even death under less appropriate conditions. For example, a study in Cotonou, Benin, found that one in 20 women having had a cesarean died from post-cesarean complications (Fourn et al. 1994). The second reason is because non-medically indicated cesareans are an increasing problem in the developing world, even in settings where use is very low (Ronsmans 2001). The hospital-based cesarean section rates of 20 to 34 percent from this study are not uncommon in referral hospitals in developing countries. However, interpreting the appropriateness of these rates is difficult without additional information on the indications for the procedure. This information is not available in the maternity registers examined in this study. Consequently, an exercise to explore indications for cesarean using other facility-based data sources would be required to complement the quarterly monitoring of this procedure.

The results regarding the effectiveness of referral in these two departments reflect a weak link in the functioning of the health system. These findings do not originate from the registers themselves. They are the result of a special study in which the names of women who were referred to a higher level of care were followed up at the referral site. The data suggest that nearly one in two women referred to a higher

level of care were never admitted to the destination hospital. These women or their families did everything that the Safe Motherhood Initiative asks. They recognized the seriousness of their condition, organized and paid for transportation to a near-by health facility and, in the end, most likely did not receive the care they required. The outcome for these women is unknown. There may be multiple and varying reasons for this lack of compliance including: financial inaccessibility, lack of transport and fear. In any case, given that free of charge ambulances are not going to be made available at all hospitals in the near future, solutions to this serious problem need to be reached locally, possibly in collaboration with local planning authorities known in throughout West Africa as COGEC (Comité de Gestion Communautaire). Hospital-based data can play an important role in these discussions.

Use of oxytocics was documented in 38 to 47 percent of deliveries in Atlantique and 13 to 27 percent in Zou. Interpretation of the data on use of oxytocics requires more detail. As recorded in the registers, and presented in the analyses here, it is not possible to distinguish between (a) use of oxytocics during the first and second stages of labor versus use during the third stage of labor and (b) use of oxytocics during normal versus dysfunctional labor. Use of oxytocics during the first and second stages of labor for normal labor has been shown to be common in Benin. For example, a study in Abomey and Porto Novo reported use of oxytocics during normal labor in 9 and 21 percent respectively of facility-based deliveries. When these data were pooled with two additional study sites in Congo and Senegal, the odds of stillbirth associated with this practice was 1.9 (95% confidence interval: 1.1-3.4). After controlling for potential confounding factors, the odds of neonatal resuscitation among women in normal labor from the four study sites varied from 1.8 to 4.9, with two of the four studies showing statistically significant odds (Dujardin et al. 1995). Thus, inappropriate use of oxytocics has been shown to be detrimental to child health. In contrast, routine use of oxytocics during the third stage of labor is now recommended as a means of decreasing the risk of postpartum hemorrhage (WHO 2000), although this practice is not yet well established in developing countries. More specific recording practices regarding the timing of the administration of oxytocics and the normality of the labor are needed for this indicator to be useful.

Initiating *use* of these data for monitoring at the facility level will require staff training and supervision, as there is little evidence of this practice in place. The training effort needed for data compilation would be minimal as some of these data are already being collected for the National Health Information System. The examination, interpretation and discussion of these data and the implementation of change based on these data would require a low level of on-going follow up. The fact that the focus groups with both the physicians and the midwives/nurses reported that these data were not being used to discuss the process or quality of care and that none of the focus group participants could suggest ways in which these data could be used, suggests that there is no tradition of using data for this purpose and suggests that they were not exposed to this practice during their training.

From this, the authors surmise that approximate targets or predetermined ranges for each indicator would be needed to guide interpretation of the data. For example, use of oxytocics to “direct” delivery is such a common practice that 40 percent may not be perceived as overuse. The idea of establishing acceptable ranges within a maternity for specific indicators is the basis of criterion-based clinical audits (Wagaarachchi et al. 2001), a promising new approach to clinical audit that does, however, require access to the most updated literature, agreement upon indicators to monitor, the establishment of targets for those indicators and data compilation and preparation. The issue addressed by this study was what an individual health facility can do that does not require additional external resources. The conclusion drawn from this study is that informative data are currently and readily available, that staff value these data, that staff are open to the idea of using these data but have no past experience on which to draw to do so. The production of a manual which walks facility staff through the production of indicators is one step. However, without some assistance in the interpretation and response to these indicators, behavior change at the individual or institutional level is unlikely. Ultimately, the skills involved in basic review of data need to be addressed during pre-service training.

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